

### **REMARKS**

The applicant respectfully requests reconsideration in view of the amendment and the following remarks. Applicant has amended incorporated claim 7 into claim 1. In addition support amended claim 1 can be found in the specification at page 4, lines 24-26. The applicant has rewritten claim 12 into better form. The applicant has cancelled claim 2.

Claims 5 and 16 are rejected as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. Claims 1, 2, and 6-10 are rejected as being anticipated under 35 USC § 102 (b) by Doeuvre (Bull. De la Soc. Chim. De France, 1929) ("Doeuvre"). Claims 3, 4, 11, 14, 15, and 17-19 are rejected as being unpatentable over Doeuvre further in view of Brocker (US 6,162,758) ("Brocker"). Claim 12 is rejected as being unpatentable over Doeuvre and Brocker et al as applied to claims 3, 4, 11, 14, 15, and 17-19, and further in view of Woroch et al. (US 2,990,422 ) ("Woroch"). The applicant respectfully traverses these rejections.

#### **112 Rejection**

Claims 5 and 16 are rejected as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. "calcite" is the thermodynamically more stable crystal structure of calcium carbonate which is well known to those of skill in the art as can be seen from standard general references (see , e.g. Kirk-Othmer Encyclopedia of Chemical Technology, Third Edition (1978), 427-428 a copy of which is enclosed). The applicant believes that this term is understood by one of ordinary skill in the art. For the above reasons, this rejection should be withdrawn.

#### **102 Rejection**

Claims 1, 2, and 6-10 are rejected as being anticipated under 35 USC § 102 (b) by Doeuvre. The amended claim 1 is not anticipated by Doeuvre, because Doeuvre only discloses reduced copper as a catalyst and does not disclose the catalysts of the process according to amended claim 1. For the above reasons, this rejection should be withdrawn.

### **103 Rejection**

Claims 3, 4, 11, 14, 15, and 17-19 are rejected as being unpatentable over Doeuvre further in view of Brocker. Claim 12 is rejected as being unpatentable over Doeuvre and Brocker as applied to claims 3, 4, 11, 14, 15, and 17-19, and further in view of Woroch.

As the Examiner has correctly acknowledged, Doeuvre does not disclose nor teach the applicant's claimed catalyst. The Examiner has relied upon the teaching of Brocker.

The applicant points out that the applicant has incorporated claim 7 into claim 1, and for this reason alone, since claim 7 was not rejected over this combination of references, this rejection should be withdrawn.

Furthermore, amended claim 1 is not obvious over Doeuvre in view of Brocker to a person of ordinary skill in the art. Doeuvre teaches a process for the catalytic dehydrogenation of d-citronellol to d-citronellal under reduced pressure in the presence of reduced (and therefore metallic and neutral) copper as a catalyst (see page 1, lines 4 and 5). Low selectivity and disintegration or polymerization of the reactants along with formation of unwanted side products is a common problem of reduced metals as catalysts in that type of reaction (as described for reduced silver as a catalyst on page 1, lines 7 to 12 of Doeuvre) known to those of skilled in the art. Furthermore reduced metal catalysts are expensive and therefore disadvantageous for the use in commercial scale.

A person of ordinary skill in the art would not have considered the catalysts disclosed by Brocker as suitable catalysts for the dehydrogenation of aldehydes or ketones with a racemizable stereocenter in the  $\alpha$  or  $\beta$  position of the carbonyl group. Those stereocenters are sensitive to racemization in the presence of acids and bases by enolization of the  $\alpha,\beta$ -unsaturated carbonyl group.

Brocker's PCT counterpart is disclosed in the applicant's specification at page 1, lines 25-27. Brocker, however, discloses specific catalysts comprising zinc oxide and calcium carbonate and a method for the dehydrogenation of **secondary cyclic alcohols**, especially **cyclohexanol** (See the abstract and the examples) and not aldehydes or ketones with a racemizable stereocenter in the  $\alpha$  or  $\beta$  position of the carbonyl group. The catalyst comprises zinc oxide and calcium carbonate both being bases which would have to be considered as being able to deprotonate and therefore racemize optically active substrates with a stereocenter in the  $\alpha$  and/or  $\beta$  position of a carbonyl group. It was surprising that catalyst comprising the basic catalysts known from Brocker as being suitable catalysts for the dehydrogenation of cyclic

achiral alcohols (i.e. molecules without a stereocenter) are also suitable for the gas-phase hydrogenation of chiral aldehydes or ketones with racemizable stereocenters in the  $\alpha$  and/or  $\beta$  position of the carbonyl group.

Claim 12 as amended comprises the process for the preparation of optically active citronellal according to claim 1 followed by cyclization to form isopulegol and subsequent hydrogenation. Woroch does not cure the deficiencies of the Doeuvre and Brocker. For the above reasons, these rejections should be withdrawn.

In view of the above amendment, applicant believes the pending application is in condition for allowance.

Applicant believes no fee is due with this response. However, if a fee is due, please charge our Deposit Account No. 03-2775, under Order No. 12810-00342-US from which the undersigned is authorized to draw.

Dated: February 3, 2008

Respectfully submitted,

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Enclosure: Kirk-Othmer' Encyclopedia of Chemical Technology, Third Edition (1978), 427- 428

Vol. 4

## CALCIUM COMPOUNDS (CALCIUM CARBONATE) 427

## CALCIUM CARBONATE

Calcium carbonate [471-34-1],  $\text{CaCO}_3$ , mol wt 100.09, is the major constituent of limestone which is used in the manufacture of quicklime or hydrated lime; these in turn are the sources of most calcium compounds including precipitated calcium carbonate. Calcium carbonate occurs naturally in the form of marble, chalk, and coral.

Powdered calcium carbonate is produced by either chemical methods or by the mechanical treatment of the natural materials. The term, precipitated calcium carbonate, applies to the commercial types of the compound produced chemically in a precipitation process. The precipitated products are distinguished by a finer, more uniform particle size, a narrower size range, and a higher degree of chemical purity.

Precipitated calcium carbonate dates back to 1850 when J & E Sturge Ltd., Birmingham, England, started production using calcium chloride and sodium carbonate as the reactants. Commercial production in the United States was started in ca 1913 by the West Virginia Pulp and Paper Company (Westvaco), Luke, Md. In 1928, production was stopped at this plant and manufacture began in Covington, Va.; both plants employed the direct carbonation of milk-of-lime.

Within the next few years production was underway by two of the present U.S. producers of precipitated calcium carbonate: the Mississippi Lime Company, St. Genevieve, Mo., where production was started in 1928 by the Peerless Lime Company and the Minerals, Pigments and Metals Division of Pfizer Inc., Adams, Mass., where manufacture was begun in 1933 by the New England Lime Company.

Precipitated calcium carbonate is one of the most versatile mineral fillers and is consumed in a wide range of products including paper, paint, plastics, rubber, textiles, putties, caulks, sealants (qv), adhesives (qv), and printing ink (see Fillers). USP grades are used in dentifrices (qv), cosmetics, foods, and pharmaceuticals. Precipitated calcium carbonate is produced in a number of grades for these applications.

## Properties

Calcium carbonate occurs naturally in two crystal structures, calcite [13397-26-7] and aragonite [14791-73-2]. Calcite is thermodynamically stable at all investigated pressures and temperatures (1). The aragonite polymorph is metastable and irreversibly changes to calcite when heated in dry air to about 400°C, the rate increasing with temperature. The transformation is much more rapid when in contact with water or solutions containing calcium carbonate and may take place at room temperature.

The crystal forms of calcite are in the hexagonal system. There are more than 600 reported crystal habits for calcite in contrast to 10-15 for other isostructural carbonates.

Aragonite is in the orthorhombic system. The usual crystal habits are acicular or elongated prismatic. In the commercial forms of precipitated calcium carbonate where aragonite predominates, crystals have parallel sides and large length-to-width

## 428 CALCIUM COMPOUNDS (CALCIUM CARBONATE)

ratios. Rapid precipitation, high concentration of reactants, high temperatures, and the presence of divalent cations increase the tendency to produce aragonite (2).

Most commercial grades of precipitated calcium carbonate have a dry brightness in excess of 98% and have a minimum purity of 98%, the major contaminants being magnesium carbonate and silica. Products are available with average particle sizes ranging from submicrometer (ca 0.03  $\mu\text{m}$ ) to coarse (ca 5  $\mu\text{m}$ ).

The essential properties of the two crystal polymorphs are shown below.

Property	Calcite	Aragonite
refractive index		
$\alpha$		1.580
$\beta$		1.681
$\gamma$		1.685
$\epsilon$	1.4864	
$\omega$	1.6583	
density, $\text{kg/m}^3$	2710	2930
bp (dec), $^{\circ}\text{C}$	898	825
solubility, $\text{g}/100 \text{ cm}^3 \text{ H}_2\text{O}$		
at 25 $^{\circ}\text{C}$	0.0014	0.00153
at 75 $^{\circ}\text{C}$	0.0018	0.00190

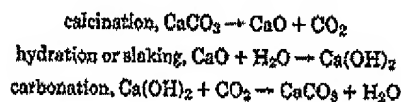
## Manufacturing and Processing

Precipitated calcium carbonate can be produced by several methods but only the carbonation process is commercially used in the United States today. This is the simplest and most direct process, using the most readily available and lowest cost raw materials.

Limestone is calcined in a kiln to obtain carbon dioxide and quicklime. Generally, these products are purified separately before recombining. The quicklime is mixed with water to produce either a milk-of-lime or dry hydrated lime; both are essentially all calcium hydroxide. When dry hydrate is used in the process, water is added to produce a milk-of-lime slurry.

In the carbonation process, the cooled and purified carbon dioxide-bearing kiln gas is bubbled through the milk-of-lime in a reactor known as a carbonator. Gasing continues until all the calcium hydroxide has been converted to the carbonate. The end point can be monitored by pH or by chemical measurements.

The reactions involved in this production method are:



Reaction conditions determine the type of crystal, the size of particles, and the size distribution produced. The process variables include starting temperature, temperature during carbonation, rate of mixing, pH, concentration of reactants, and the presence or absence of chemical additives.